

***Will these agents completely
"control" my infestation?***

Biological programs do not eradicate the invasive species but reduce the impact to an acceptable level.

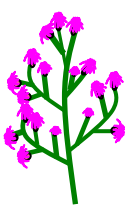
***How do I know I have a good site
for biological control?***

Typically a good site is at least 2 acres in size and can be left undisturbed for 4 years.

***How long does it take these
agents to populate the area?***

Since these bioagents only produce one generation per year, it takes years to produce a large population. As populations increase, you can expect a decrease in knapweed density.

Remember that if your site is to be a success you need an integrated approach to control. Many approaches have been tested or are currently being studied combining herbicides, prescribed fire, native seed plantings, etc, with biological control. Until the results from these studies are completed current recommendations are to combine minimal disturbance native plant seeding (such as frost seeding) with biological control so your site will have a seed source to repopulate after your agents begin to provide control.



***For More
Information***



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Internet Resources:

www.dnr.state.wi.us/invasives/fact/knapweed.htm

www.invasive.org/weeds/knapweed

www.mda.state.mn.us/weedcontrol/knapweed.htm

www.nysaes.cornell.edu/ent/biocontrol

Special Thanks



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***Spotted Knapweed
Biological Control
In Wisconsin***



Cyphocleonus achates
Root mining weevil

Spotted Knapweed

Centaurea stoebe L. ssp. *micranthos* (Gugler) Hayek
(synonym *C. biebersteinii*)

INTRODUCTION

The North American species of spotted knapweed is native to Eurasia, perennial, and a polycarpic (multistemmed) plant. As this plant ages it grows additional stems originating from its base. It has been documented to live up to 9 years. Spotted knapweed is a very aggressive and versatile plant.

It is able to grow in many different types of soil (prefers well drained), is a prolific seed producer, and produces an allelopathic chemical to suppress neighboring plants, allowing knapweed to dominate desirable vegetation.

Knapweed biological control is an effective, cost efficient, and long-term method. Knapweed biological control in Wisconsin is still in its early stages, however, much is being done. Insectaries were started to provide “in state” populations for distribution. Currently, most knapweed biological agents are brought in from Minnesota, in cooperation with the Minnesota Department of Agriculture. Special permits are required to transport agents across the state line.

It is our goal to have sites at harvestable levels in the near future, making it easier for both government organizations and private citizens in Wisconsin to obtain knapweed biological agents.

Biological Control Agents

A successful biological control site would incorporate all of the following agents, or at least a seedhead weevil and a root mining agent.



Cyphocleonus achates is a large, grayish root mining weevil. Adult females lay their eggs at the base of the knapweed plant. The larvae then hatch and mine into the root vascular

tissue. They feed on the root until emerging as adults the following summer. This causes significant damage to the taproot of the knapweed plant.



Urophora affinis and *U. quadrifasciata* are two seedhead flies that were released in Wisconsin in 1991 by the USDA in Washburn and Waukesha Counties. Today populations are well distributed throughout most of Wisconsin. The adult lays her eggs on seedheads in the spring. The larvae hatch and burrow into the seedhead where they feed on developing seed. This feeding induces the formation of a gall around the larvae, which displaces developing seeds.



Larinus minutus and *L. obtusus* are closely related, small blackish colored, gall forming weevils. They lay their eggs on the knapweed seedhead,

and the larvae consume the developing seeds. The larvae then form a pupal chamber from the seed coats within the seedhead. The adults then emerge from the seedhead to feed on the foliage before overwintering in the duff layer.



Agapeta zoegana is a small, yellowish, root mining moth. They lay their eggs on the stems of the knapweed plant in July. Larvae hatch and mine their way into the root cortex

and emerge as adults the following summer. This damages the root and provide an entry point for pathogens which can cause additional harm.